

**Amendment and Response**

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Serial No.: 09/603,132

Confirmation No.: 3538

Filed: June 23, 2000

For: DEVICE STRUCTURES INCLUDING RUTHENIUM SILICIDE DIFFUSION BARRIER LAYERS**Amendments to the Claims**

This listing of claims replaces all prior versions, and listings, of claims in the above-identified application:

1-44. **Canceled.**

45. **(Previously Presented)** A semiconductor device structure, the structure comprising:  
a substrate assembly including a surface; and  
a chemical vapor codeposited diffusion barrier layer over at least a portion of the surface, wherein the diffusion barrier layer is formed of  $\text{RuSi}_x$ , where x is in the range of about 0.01 to about 10.

46. **(Previously Presented)** The structure of claim 45, wherein x is in the range of about 1 to about 3.

47. **(Previously Presented)** The structure of claim 46, wherein x is about 2.0.

48. **(Previously Presented)** The structure of claim 45, wherein the at least a portion of the surface is a silicon containing surface and further wherein the structure includes one or more additional conductive layers over the diffusion barrier layer formed of at least one of a metal and a conductive metal oxide.

49. **(Currently Amended)** The A semiconductor device structure of claim 48, the structure comprising:

a substrate assembly including a surface, wherein the at least a portion of the surface is a silicon containing surface; and

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a chemical vapor codeposited diffusion barrier layer over at least a portion of the surface, wherein the diffusion barrier layer is formed of  $\text{RuSi}_x$ , where x is in the range of about 0.01 to about 10,

wherein the structure includes one or more additional conductive layers over the diffusion barrier layer formed of at least one of a metal and a conductive metal oxide, and

further wherein the one or more conductive layers are formed from materials selected from the group of  $\text{RuO}_2$ ,  $\text{RhO}_2$ ,  $\text{MoO}_2$ ,  $\text{IrO}_2$ , Ru, Rh, Pd, Pt, and Ir.

50. (Previously Presented) A capacitor structure comprising:

a first electrode;

a high dielectric material on at least a portion of the first electrode; and

a second electrode on the dielectric material, wherein at least one of the first and second electrode comprises a chemical vapor codeposited diffusion barrier layer formed of  $\text{RuSi}_x$ , where x is in the range of about 0.01 to about 10.

51. (Previously Presented) The structure of claim 50, wherein x is in the range of about 1 to about 3.

52. (Currently Amended) ~~The A capacitor structure of claim 50 comprising:~~

a first electrode;

a high dielectric material on at least a portion of the first electrode; and

a second electrode on the dielectric material, wherein at least one of the first and second electrode comprises a chemical vapor codeposited diffusion barrier layer formed of  $\text{RuSi}_x$ , where x is in the range of about 0.01 to about 10,

wherein the first electrode comprises a diffusion barrier layer, wherein the diffusion barrier layer of the first electrode is formed on at least a portion of a silicon containing region, and further wherein the first electrode comprises one or more additional conductive layers

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formed over the diffusion barrier layer, the one or more additional conductive layers formed of at least one of a metal and a conductive metal oxide.

53. **(Previously Presented)** The structure of claim 52, wherein the one or more additional conductive layers are formed from materials selected from the group of  $\text{RuO}_2$ ,  $\text{RhO}_2$ ,  $\text{MoO}_2$ ,  $\text{IrO}_2$ , Ru, Pt, and Ir.

54. **(Previously Presented)** An integrated circuit structure comprising:  
a substrate assembly including at least one active device and a silicon containing region;  
and  
an interconnect formed relative to the at least one active device and the silicon containing region, the interconnect including a chemical vapor codeposited diffusion barrier layer on at least a portion of the silicon containing region, wherein the diffusion barrier layer is formed of  $\text{RuSi}_x$ , where x is in the range of about 0.01 to about 10.

55. **(Previously Presented)** The structure of claim 54, wherein x is in the range of about 1 to about 3.

56. **(Previously Presented)** The structure of claim 54, further comprising a conductive contact material formed relative to the diffusion barrier layer.

57. **(Currently Amended)** A semiconductor device structure, the structure comprising:  
a substrate assembly including a surface defining an opening having an aspect ratio greater than about 1; and  
a chemical vapor codeposited diffusion barrier layer on over at least a portion of the surface defining the opening, wherein the diffusion barrier layer is formed of  $\text{RuSi}_x$ , where x is in the range of about 0.01 to about 10.

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58. (Previously Presented) The structure of claim 57, wherein the diffusion barrier layer comprises a conformal layer within the opening.
59. (Previously Presented) The structure of claim 57, wherein the diffusion barrier layer comprises a conformal layer of uniform thickness within the opening.
60. (Currently Amended) ~~The A semiconductor device structure of claim 57, wherein the opening has, the structure comprising:~~  
a substrate assembly including a surface defining an opening having an aspect ratio greater than about 3; and  
a chemical vapor codeposited diffusion barrier layer on at least a portion of the surface defining the opening, wherein the diffusion barrier layer is formed of  $\text{RuSi}_x$ , where x is in the range of about 0.01 to about 10.
61. (Previously Presented) The structure of claim 60, wherein the diffusion barrier layer comprises a conformal layer within the opening.
62. (Previously Presented) The structure of claim 60, wherein the diffusion barrier layer comprises a conformal layer of uniform thickness within the opening.
63. (Currently Amended) A capacitor structure comprising:  
a first electrode;  
a high dielectric material on at least a portion of the first electrode; and  
a second electrode on the dielectric material, wherein at least one of the first and second electrodes has a surface defining an opening having an aspect ratio greater than about 1, wherein a chemical vapor codeposited diffusion barrier layer is on over at least a portion of the surface defining the opening, and wherein the diffusion barrier layer is formed of  $\text{RuSi}_x$ , where x is in the range of about 0.01 to about 10.

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64. (Previously Presented) The capacitor structure of claim 63, wherein the diffusion barrier layer comprises a conformal layer within the opening.

65. (Previously Presented) The capacitor structure of claim 63, wherein the diffusion barrier layer comprises a conformal layer of uniform thickness within the opening.

66. (Currently Amended) ~~The A~~ capacitor structure of claim 63, wherein the opening has comprising:

a first electrode;

a high dielectric material on at least a portion of the first electrode; and

a second electrode on the dielectric material, wherein at least one of the first and second electrodes has a surface defining an opening having an aspect ratio greater than about 3, wherein a chemical vapor codeposited diffusion barrier layer is on at least a portion of the surface defining the opening, and wherein the diffusion barrier layer is formed of  $\text{RuSi}_x$ , where x is in the range of about 0.01 to about 10.

67. (Previously Presented) The capacitor structure of claim 66, wherein the diffusion barrier layer comprises a conformal layer within the opening.

68. (Previously Presented) The capacitor structure of claim 66, wherein the diffusion barrier layer comprises a conformal layer of uniform thickness within the opening.

69. (Currently Amended) A semiconductor device structure, the structure comprising:  
a substrate assembly including a surface defining an opening, with the proviso that the surface defining the opening is not a silicon containing surface; and  
a chemical vapor codeposited diffusion barrier layer on over at least a portion of the surface defining the opening, wherein the diffusion barrier layer is formed of  $\text{RuSi}_x$ , where x is in the range of about 0.01 to about 10.

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70. **(Previously Presented)** The structure of claim 69, wherein the diffusion barrier layer comprises a conformal layer within the opening.

71. **(Previously Presented)** The structure of claim 69, wherein the diffusion barrier layer comprises a conformal layer of uniform thickness within the opening.

72. **(Previously Presented)** The structure of claim 69, wherein the opening has an aspect ratio greater than about 1.

73. **(Previously Presented)** The structure of claim 72, wherein the diffusion barrier layer comprises a conformal layer within the opening.

74. **(Previously Presented)** The structure of claim 72, wherein the diffusion barrier layer comprises a conformal layer of uniform thickness within the opening.